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BULLETIN OF THE UNIVERSITY OF WISCONSIN
ENGINEERING SERIES, VOL. 1, NO. 7, PP. 185–226.

EMERGENCIES IN RAILROAD WORK.

BY

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Special University Lecturer.

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BULLETIN OF THE UNIVERSITY OF WISCONSIN
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EMERGENCIES IN RAILROAD WORK.*

BY L. F. LOREE, M. AM. SOC. C. E.
Division Superintendent, Penna. Co.

An emergency, as defined by the Century dictionary, is a sudden or unexpected occasion for action—a perplexing contingency or complication of circumstances.

It may readily be believed that in a business so extensive, so diversified, and so complicated as is that of transportation, emergencies might be expected. They do occur "many times and oft" and their frequency, variety and gravity constitute one of the charms that make railroad operating the most fascinating of modern pursuits. Of their infinite variety I have selected for discussion as being in the line of your training and likely to come within your early experience, if you elect to follow this business, the emergencies of Wrecks, Washouts, and Strikes.

I have not hesitated to confine myself to my personal experience. It is from that point of view that I can speak with the greatest confidence. Moreover, it has seemed to me the more likely to engage your attention, and as it presents no exceptional features it will help you to form a correct idea of real work, which is after all one of the chief objects of this series of lectures. If I have seemed to emphasize the matter of commissary it is to be remembered that no less an authority than Davoust has said, "The success of an army depends very much upon the efficiency of its commissary." As the army exists for the handling of emergencies we may well take a lesson from the book of its experience.

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* A lecture delivered before the students of the College of Mechanics and Engineering University of Wisconsin, March 22nd, 1895.

p10845

WRECKS.

The story of "the Pitcher that went oft to the well and was broken at last" finds here a fine exemplification. It may be an axle that had run thousands of miles develops some hidden defect that no inspection could detect, breaks when the car is being moved at high speed, letting it down on the rail; those behind are piled upon it, and the movement of traffic is brought to a standstill until the débris is removed and the track replaced. Or, it may be that some old and trusted employe, who has executed safely thousands of train orders, in some way that admits of no explanation, overlooks one, pulls out in the face of an opposing train; the collision adds to the destruction of property, loss of life; the dead must be coffined, the injured given surgical aid, the normal condition restored.

I can only point out here to what these accidents are due and what means have been and are being adopted to prevent them. The Railroad Gazette has, for many years, published statistics of train accidents based mainly on newspaper reports. This data, though very incomplete, is all we have in this country. From an editorial of February, 1893, I quote the following table:

TABLE "A."—*Railroad accidents in the United States, 1873 to 1892.*

[From the Railroad Gazette.]

CHARACTER OF ACCIDENT.	*Annual average per period.*					*Percentage of total per annum.*				
	1873 to 1877.	1878 to 1882.	1883 to 1887.	1888 to 1892.	1892.	1873 to 1877.	1878 to 1882.	1883 to 1887.	1888 to 1892.	1892.
Collisions.										
Rear	155	275	342	464	485	.147	.248	.250	.221	.208
Butting	96	121	174	286	251	.091	.109	.126	.136	.108
Crossing and Misc'l	43	21	32	209	326	.041	.019	.024	.099	.140
Total collisions	294	417	549	959	1,062	.279	.376	.400	.456	.456
Derailments from										
Defects of road	149	116	192	176	191	.147	.105	.140	.084	.082
Defects of equipment	76	79	108	169	206	.072	.071	.078	.080	.088
Negligence in operation	97	91	105	125	164	.092	.082	.077	.060	.070
Unforeseen obstructions	158	128	156	198	179	.150	.116	.114	.094	.077
Unexplained	228	232	187	384	425	.217	.209	.136	.182	.183
Total derailments	708	616	748	1,052	1,165	.673	.583	.545	.500	.500
Accidents without collisions or derailments										
To locomotives	23	29	39	34	34	.021	.026	.028	.002	.002
To cars	13	8	18	17	15	.012	.007	.013	.001	.001
Cars burned while running	9	8	10	12	13	.009	.007	.008	.001	.001
Other causes	6	1	8	29	38	.006	.001	.006	.001	.001
Total accidents without collisions or derailments	51	46	75	92	100	.048	.041	.055	.004	.004
Total train accidents	1,053	1,109	1,372	2,103	2,327	......	......	......	......	.....
Revenue train mileage—millions	.....	......	570.7	781.2	870	.....	....	......	......	......

TABLE "B."—*Relative frequency of different classes of railroad accidents in the United States.*

CHARACTER OF ACCIDENTS.	*Number of accidents per one million train miles.*			*Train miles run to one accident.*		
	1883 to 1887.	1888 to 1892.	1892.	1883-1887.	1888-1892.	1892.
Collisions.						
Rear	.60	.59	.56	1,663,666	1,694,515	1,785,714
Butting..........	.30	.37	.29	3,333,333	2,702,702	3,448,272
Crossing and miscellaneous.	.06	.27	.37	16,666,666	3,703,703	2,702,702
Total collision...........	.96	1.23	1.22	1,041,625	812,113	819,754
Derailments from						
Defects of road..	.34	.23	.22	2,941,173	4,347,821	4,545,454
Defects of equipment.......	.19	.22	.23	5,263,157	4,545,454	4,347,821
Negligence in operating. ...	.19	.16	.19	5,263,157	6,250,000	5,263,157
Unforeseen obstructions ...	.27	.25	.21	3,703,703	4,000,000	4,761,904
Unexplained.....	.32	.49	.49	3,125,000	2,040,816	2,040,816
Total derailments.......	1.31	1.35	1.34	763,358	740,740	746,268
Accidents without collision or derailment						
To locomotives.......... ...	.07	.05	.04	14,285,714	20,000,000	25,000,000
To cars.....................	.03	.02	.02	33,333,333	50,000,000	50,000,000
Cars burned while running.	.02	.02	.01	50,000,000	50,000,000	100,000,000
Other causes................	.01	.03	.04	100,000,000	33,333,333	25,000,000
Total accidents without derailments or collision..............	.13	.12	.11	7,692,317	8,333,333	9,090,909
Total train accidents...	2.40	2.70	2.67	416,666	370,370	374,531
Train mileage in millions...	570.7	781.2	870	....	....	....

TABLE "C."—*Railroad accidents, C. & P. Division, Penna. Co.*

July 1st, 1892, to December 31st, 1894.

CHARACTER OF ACCIDENTS.	*Annual average for period.*		*Per cent. of total per annum.*		*Annual average cost for period.*		*Percentage of cost per annum.*	
	Main track.	Sidings.	Main track.	Sidings.	Main track.	Sidings.	Main track.	Sidings.
Collisions.								
Rear	2.	.4	.036	.003	$589 08	$18 00	.039	.004
Butting	2.4	1.2	.043	.008	4,015 87	53 46	.269	.012
Break-in-two	6.8	2.8	.124	.019	2,746 83	224 77	.185	.052
Crossing and misc'l	4.4	4.	.081	.027	390 13	552 68	.026	.127
Total collisions	15.6	8.4	.285	.057	7,741 91	848 91	.519	.195
Derailments from								
Defects of road	2.	26.8	.036	.181	$95 93	$614 84	.006	.142
Defects of equipment	20.	19.6	.365	.132	6,067 73	393 69	.407	.091
Negligence in operating	6.	55.6	.110	.376	438 46	1416 37	.029	.326
Unforeseen obstruction	2.8	1.2	.051	.008	263 91	28 57	.018	.006
Unexplained	3.6	19.6	.066	.132	236 12	424 71	.016	.098
Total derailments	34.4	122.8	.628	.829	7,102 15	2878 18	.476	.663
Accidents without collision or derailments								
To locomotives	.8	.4	.014	.003	$5 40	$ 48	.0003	.0001
To cars	2.8	15.2	.051	.103	60 74	605 60	.0041	.1394
Cars burned while running	....	....	....	....	....	....	....	....
Other causes	1.2	1.2	.022	.008	9 85	10 44	.0006	.0025
Total accidents without collision or derailments	4.8	16.8	.087	.114	75 99	616 52	.005	.142
Total train accidents	54.8	148.	1.00	1.00	14920 05	4343 61	100.	100.
Train mileage	2609677	....	....	....	....	....	....	....

TABLE "D."—*Relative frequency of different classes of main track accidents C. & P. Division, Penna. Co.*

July 1st, 1892, to December 31st, 1894.

CHARACTER OF ACCIDENTS.	No. of accidents per one million train miles for the period.	Train miles run to one accident.
Rear collisions	.77	1,304,839
Butting collisions	.92	1,087,365
Break-in-two collisions	2.62	383,776
Crossing and miscellaneous collisions	1.69	590,835
Total collisions	6.	167,287
Derailments from		
Defects of road	.77	1,304,839
Defects of equipment	7.69	120,483
Negligence in operating	2.31	434,946
Unforeseen obstruction	1.08	932,027
Unexplained	1 39	724,910
Total derailments	13.24	75,862
Accidents without collision or derailment		
To locomotives	.30	3,262,096
To cars	1.08	932,027
Cars burned while running	....	....
Other causes	.46	2,174,731
Total accidents without collision or derailment	1.84	543,683
Total train accidents	21.08	47,622
Total train mileage in millions	2.6	....

Much has been done to lessen both the number and destructiveness of accidents by improvements in the road-bed, bridges, and track, in the construction of engines and cars, in the adoption of the Miller platform, couplers of the Master Car Builder type, the Westinghouse air-brake, interlocking apparatus, and signaling devices. Just now we are going in strongly for block signaling and bid fair to overdo it. After all, we have in every operation to fall back on human agencies, and it must occur to the most casual observer that we can best improve the service by improving the discipline. As these tables indicate, and as Mr. Haines, the president of the American Railway Association, never tires of pointing out, "the lack of unquestioned obedience to authority and of prompt compliance with established rules is at the bottom of more railway accidents than all other causes put together."

But now the wreck having occurred, the main track obstructed and traffic interrupted, let us see what steps are taken in the emergency.

Before an engineman is promoted to that responsible position he has served an apprenticeship as a fireman for five or more years. During this time great pains have been taken to perfect him in the details of his work. By instruction on the road and in the shop and round-house, and by periodical examinations, he has been taught how to care for the engine, how to repair or overcome minor breakages, and how to keep it moving though not working all its parts. The training of the brakeman for the position of conductor has proceeded along similar lines. The men take great pride in retracking derailed cars, in placing the engine in condition to proceed though in a crippled condition, in keeping the road open for traffic.

But frequently other help is necessary, and for this wreck trains are maintained at convenient points, consisting usually of a derrick car, a car carrying truck and blocking, and a tool car, used also by the men in riding to and from the wreck and as an office by the foreman. Where there are three or four running tracks, and in or near cities where the right of way is covered with tracks and there is no place to deposit the debris, thus making it necessary to load up and move away the wreckage to dispose of it or at least to move it off to an adjacent place, and that without greatly disturbing the adjoining tracks which it is desirable at once to bring into active use for the movement of traffic, a steam derrick is likely to prove not only the most effective but the most economical appliance to employ. This is especially true because at such points there are usually massed men and machinery. But in the operation of double track and especially on single track where the wreckage can be rolled off to either side it is probable that the track can be quite as speedily cleared by the use of jacks and block and tackle as by any other method, and the use of a steam derrick, which under such circumstances would be a costly and cumbersome machine, should be avoided. Where the train works on either side of its station the derrick car should be equipped with a derrick at each end to avoid the delay from turning the car. The style and capacity of wrecking derricks have not kept pace with the rapid and great increases in the size and weight of cars. There are but few in use that are well adapted for the work they have to do.

A good hand derrick should meet the following requirements:

1. Car to be thirty-four feet long.
2. To have a derrick at each end.
3. Derrick to have curved boom.
4. Derrick mast to be turned by gearing.
5. Derrick to have a lift of twelve feet from top of rail, to have a reach of fifteen feet from center of car, the center of the mast to go over the center of the truck and to be set back seven feet from the end of the car.
6. Derrick to have a maximum capacity of fifteen tons.
7. Derrick to have two speeds for lifting.
8. To be equipped with wire cables for lifting with hand power or with locomotive power.
9. Car to be provided with swinging iron side arms or jack arms so that derrick can be operated to its full capacity working off the side of the car.
10. Car to be provided with screws on the axles for leveling its deck when working on curves.

11. Derrick to have adjustable counter weight so that it may lift the heaviest truck in service and be moved about on the track either on tangents or curves while carrying truck.

Tools carried on wreck cars, C. & P. Division Penna. Co.

No.	Kind.
1	Air brake hose, 1¼ in. frt
1	Augur, 1 3-16 in.
1	Augur, 1 15-16 in.
1	Augur, 1½ in.
1	Augur, 1¾ in.
2	Axes.
1	Bars, claw.
2	Bars, chisel.
4	Bars, pinch.
1 pr	Blocks with line 1⅛ in. 300 ft. long.
1 pr	Blocks with line ⅞ in. 250 ft. long.
2	Blocks, lead for 3 in. line
1	Block, lead for 1½ in. line
1	Bolster and irons for sliding cars.
1	Broom.
1	Brush, dusting.
1	Brush, scrubbing.
2	Buckets, packing.
2	Buckets, water.
1	Can, oil, 1 gal.
4	Cans, oil, 2 gals.
1	Can, oil, 4 gals.
1	Can, water.
1	Chain, log, 1 in. 5 ft. long for derrick.
1	Chain, log, 1 in. 8 ft. long for derrick.
1	Chain, log, 1 in. 8 ft. long for derrick.
4	Chains, ⅜ in. 7 ft. long.
5	Chains, ⅝ in. 9 ft. long.
3	Chains for lifting trucks
4	Chisels, cold.
1	Chisel, cutting.
2	Canvas 20x40 ft.
1	Clamps, rail.
2	Clevises, large double.
2	Couplers, 3 link.
2	Coupling bars for engs.
2	Coupling links, crooked.
1	Cable, 1¼ in., 12 ft. long, with hooks.
1	Cable, 1½ in., 18 ft. long, with hooks.
2	Draw pins.
1	Dipper, tin.
2	Drift irons.
2	Drift hammers.
1	File, 16 in.
2	Flags, green.
2	Flags, red.
6	Forks, coke.
2 pr	Frogs, Tilden wrecking.
1 pr	Frogs, G. and R.
2	Frogs, short iron tracking.
1	Frog, long iron tracking
2	Frog planks.
1	Frog clamp.
2	Gauges, track.
1	Gauge, wheel.
1	Gauges, iron.
1	Grappling hook.
2	Hammers, 2 pound.
2	Hammers, riveting.
1	Hammer, soft.
1	Hose, 2 in., 50 ft. long, with couplings and nozzle.
1	Hatchet.
2	Hooks, "S".
2 pr	Ice tongs.
2	Jacks, 10 ton hydraulic, short.
2	Jacks, 15 ton hydraulic, short.
4	Jacks, 20 ton hydraulic, long.
2	Jacks, ratchet.
3	Jacks, small screw.
2	Jacks, foot or lifts.
4	Journal bearings, 3½x7 in.
4	Journal bearings, 3¾x7 in.
4	Journal bearings, 4x8 in.
6	Lights, lamp stand.
2	Lights, lanterns, red.
6	Lights, lanterns, white.
2	Lights, lanterns, markers.
1	Light, wells light.
1	Light, hand torch.
6	Lights, torches, 1 gal.

Tools carried on wreck cars, C. & P. Division, Penna Co.—Continued.

No.	Kind.	No.	Kind.	No.	Kind.
6	Levers for hydraulic jacks.	1	Rope, 3½ in., 29 ft. long	1	Stretcher.
2	Levers, wood, for ratchet jacks.	1	Rope, 5 in., 45 ft. long.	2	Sledges, 10 pounds.
2	Levers for raising track.	1	Rope, (line) 1½ in., 200 ft. long.	1	Sledge, 25 pounds.
2	Medical boxes.	1	Rope, (line) 1¼ in., 300 ft. long.	2	Spike poles.
3	Picks, clay.	1	Screw driver.	1	Telegraph office.
2	Ropes, 2 in., 50 ft. long.	1	Scraper for cleaning ice off ties.	1	Telegraph instruments (set).
1	Rope, 2 in., 26 ft. long.	1	Spike mauls.	1 pr	Telegraph pole climbers.
1	Rope, 3 in., 27 ft. long.	1	Saw, hand.	1 pr	Telegraph pulley blocks.
1	Rope, 3 in., 42 ft. long.	2	Saws, cross cut.	1 pr	Telegraph wire cutters.
1	Rope, 3 in., 75 ft. long.	10	Shovels, coal.	2	Trucks, timber.
1	Rope, 3 in., 125 ft. long.	6	Shovels, dirt.	2	Wrenches, monkey.
1	Rope, 3 in., 100 ft. long.	2	Shovels, fire.	7	Wrenches, "S."
1	Rope, 3½ in., 30 ft. long.	4	Spittoons.	1	Kitchen and table outfit for 16 men.

Tools carried for use of Road Foreman of Engines.

1	Bars, chisel.	1	Hammer, copper.	1	Wrench, monkey, 12 in.
1	Bars, pinch.	1	Hammer, hand, long.	1	Wrench, monkey, 18 in.
1	Chisel, cold.	1	Light, lantern, white.	1	Wrench, alligator.
1	Chisel, cold, long.	1	Light, hand torches.	1	Wrench, spanner.
1	Drift pin.	1	Oil can, 1 gal.	1	Wrench, box.
2	Guide blocks (sets).	1 pr	Pipe tongs.	1	Wrench, 2 in. slide.

Blocking.

100 pieces 2d hand car stringers 4 in. x 8 in. x 2 ft 6 in.
2 pieces 2d hand car stringers, 4 in. x 8 in. x 8 in.
2 pieces 2d hand car stringers, 4 in. x 8 in. x 10 in.
25 pieces oak plank, 2 in. x 10 in. x 2 ft.
25 wedges 9 in. wide scarfings from end sills.
25 wedges 9 in. wide scarfings from brake beams.

We have found it convenient to have a crew consisting of a foreman and twelve men. These men are employed about the shops where the car is kept and work at car repairs. Should one for any reason desire to absent himself from his duties, permission is first obtained of the foreman, who designates another to fill the vacancy, so that a full complement of men is always assured. Should the wreck occur during working hours the crew is advised of it by whistle signal, if at night by electric bells located in their homes.

There is a similarity between the service of the wreck train and that of a city fire department. The value of the service is greatly dependent upon the quickness with which the apparatus is got on the ground. So when the signal sounds every man hastens to his place, the most available engine and crew are pressed into the service regardless of their previous engagements, once started they are given a clear track to the point of obstruction, other trains scurry in on the lie-bys very much as travelers seek the sidewalks and teams the curb as the ringing of the fire gong announces the approaching truck. Arriving at the wreck a telegraph office is hooked up, the train wire cut in, and communication established with headquarters. A man is left in charge of the tool car, who issues the tools as they are called for, and cleans and puts them away in order as they are returned. He also keeps the coffee pot boiling and serves up a luncheon of biscuits, tinned meats, etc. Again, as at a fire, the chief effort is to prevent its spread, so here the effort is not so much to save the damaged cars as to clear the line for the movement of traffic. Nearly everything is rolled down the bank, the picking up is postponed to a more convenient season or the all accommodating Sunday. Meantime, much has been done in other directions. The party calling for assistance is required to supplement his call with a description in some detail of the situation and an estimate of the probable time required to clear. If this be more than four hours no more freights are despatched from terminals, but effort is concentrated upon marshaling trains and clearing up the yard tracks to take care of the concentrated movement which must follow the resumption of business. If the estimate is for less than four hours the trains are moved up as close as possible to the wreck and so put away on the sidings that when the movement is resumed the knot will easily untie. Meantime, arrangements are making for detouring mail trains over foreign lines and around the obstruction, or for transferring by the same from train to train. Altogether there is a fine activity which is but feebly set out in records from which I have compiled the following tables:

Wreck train service, C. & P. Division, Penna. Co.

YEAR.	*No. of times called.*		*Total time between call and start.*		*Average time between call and start.*		*Time running to wreck.*		*Time clearing wreck.*	
	6 a. m. to 6 p. m.	6 p. m. to 6 a. m.	6 a. m to 6 p. m.	6 p. m. to 6 a. m.	6 a. m. to 6 p. m.	6 p. m. to 6 a. m.	Total.	Average.	Total.	Average.
			min.	min.	min.	min.	min.	min.	min.	min.
1890...	20	20	390	713	19	36	1783	45	6136	153
1891. .	52	30	585	613	11	20	2250	27	9227	112
1892....	44	26	678	473	15	18	2682	38	7393	106
1893. ..	37	15	517	319	14	21	1693	33	4665	90
1894....	14	19	230	527	16	28	1469	45	6087	185
Total	167	110	2400	2645	....	......	9877	....	33508	....
Ave..	33	22	....	......	15	24	.....	36	....	2h. 2m.

Minimum time between call and start.

Year.	6 a. m. to 6 p. m.	6 p. m. to 6 a. m.
1890	5 mins.	13 mins.
1891	2 "	8 "
1892	3 "	8 "
1893	5 "	5 "
1894	5 "	13 "

Unusual delays in starting wreck trains.

1890—37	mins. (night) waiting for wreckmen.	43	mins. (day)	loading extra trucks.
1891—54	" " " sectionmen.			
1892—30	" " " wreckmen.	28	" "	No steam in boiler to blow alarm whistle. Had to send caller for men.
1893—57	" " Bellaire wreck train waiting for crew.	23	" "	turning derrick car.
1894—37	" " alarm out of order.	32	" "	turning derrick car.

WASHOUTS.

I had been but a short time in the service of the Pennsylvania Railroad when on March 9th, 1878, the double track wooden bridge by which their New York division crossed the Raritan river was totally destroyed by fire. The bridge was about to be replaced in iron, indeed the shore span, a draw over the Delaware and Raritan canal, had been erected on false works and was to have been swung in place on the following day. Fortunately it was not damaged, eliminating what might have been the most serious obstacle in reconstruction. In view of the contemplated erection of the new bridge the duplicate wooden structure that had for so many years been carried in stock for just such an emergency had been dispersed and used up. Nevertheless, by March 15th, traffic was resumed. During the interval the debris had been cleared away, the draw span fixed in position, and there had been erected a single track, wooden trestle one thousand and fifty feet long and forty-eight feet high, with two story bents. There is, of course, a vast difference betwixt fire and flood, not always, however, between the results of their devastations. I need not say how valuable an experience that was to a novice, with what interest I watched the marshaling of men and materials; nor speak of the impression I received as the work advanced of the resources of a great corporation, the character, devotion and *esprit* of its men. Here, too, in this initial experience I got some idea of what such work costs, for it was not accomplished without loss of life. From then till now that is the only life that has gone out under my experience in work of this class, though there is about it much of personal danger and risk that adds greatly to its interest.

On the night of May 12th, 1886, "the great storm" raged over the Miami valleys in the state of Ohio. It began about 8 p. m. and was over by 10 p. m., but during that time it is estimated that five inches of water fell in the district about the cities of Dayton and Xenia. For hours after the storm the destruction caused by the rushing waters continued, and it was not until nine o'clock of the following morning that it finally ceased. Then it was found that on the Little Miami division of the Pennsylvania lines twenty-six iron bridges, two trestle bridges, three stone arch and two box culverts, and over seven miles of track had been destroyed, for besides that carried off with the bridges there were thirty-two breaks varying from one hundred feet to six thousand feet where the track was washed off the road-bed, the road-bed cut out from under the track, or both carried off together. When the storm began there were many trains on the road and attention was at once concentrated on placing these in positions of safety and properly caring for and disposing of their passengers. How quickly these emergencies arise and how serious they are may be gathered from the following instance: No. 2, the limited, passed Spring Valley at 9:40 p. m., on time, there running into a slight shower. They ran three miles east and met a wall of water running down the track and felt the track giving way under them; they backed a short distance and stopped with their rear car on a piece of track that was washing out behind them. The train was held in this position for forty-eight hours. The flagman of No. 2 ran back three miles to Spring Valley and reported the situation to the train dispatcher, who arranged to hold all trains. The flagman then attempted to return to his train but found it impossible to get back, so much of the track having been washed away. Only the greatest care and energetic action on the part of train dispatchers and train crews prevented severe losses, perhaps including life.

The work of reconstruction was begun at 4:30 a. m. of the 13th when a work train was dispatched from the Pendleton shop with seventy-five men and several car loads of timber. As rapidly as possible the carpenter forces of the entire Southwest system, together with large details from the principal repair shops, were concentrated on this division, and the repairs pushed day and night. Each gang brought with them car loads of timber and the tool car in which they carry the working outfit for use in their regular work. The main line was opened at five o'clock of the afternoon of Saturday (the

15th). On the Dayton & Western branch where the damage had been most severe, the work was completed on Wednesday night (the 19th) about eight o'clock, when all lines were again open and full schedule resumed.

About $35,000 was spent in the repairs necessary to the resumption of traffic, $88,635.21 was spent in replacing bridges and culverts; the total loss sustained was probably not far from $125,000. The work was conducted under the personal supervision of the general superintendent, Mr. J. F. Miller, and was prosecuted with great energy. The forces, which were ample, were well distributed and the material was supplied as fast as it could be used. The work suffered seriously, however, from the necessity of quartering the men in the neighboring farm houses and barns, and from the long interruptions in going to and from meals, even when train service could be partially utilized for transport.

In June, 1891, a committee of the American Society of Civil Engineers reported "on the cause of the failure of the South Fork Dam" and from that report I abstract the following statements:

"On May 30th and 31st and June 1st, 1889, there was a "storm on an area of 20,000 square miles mostly in Pennsyl-"vania but extending into Maryland, Virginia, and West Vir-"ginia. It is estimated that about three-fourths of this area, "or 15,000 square miles, constituted the flooded area in Penn-"sylvania; the greatest amount of water appears to have fallen "near the summit of the Alleghany mountains and a little east "of the same, where the rain-fall was reported to have been "from eight to ten inches in eighteen to thirty-six hours. On "the afternoon of Friday, May 31st, the South Fork reservoir "dam suddenly broke, causing the destruction of the Pennsyl-"vania Railroad in the Connemaugh valley with a fearful loss "of more than 2,500 human lives and the annihilation of pri-"vate property amounting in value to three or four millions "of dollars. The commonwealth of Pennsylvania in 1834 had "constructed and was operating a system of communication from "Philadelphia to Pittsburg, consisting partly of railway and "partly of canal, viz.,

Railway from Philadelphia to Columbia	82	miles
Canal from Columbia to Hollidaysburg	172	"
Portage Railway over the Allegheny Mountains from Hollidaysburg to Johnstown	36	"
Canal from Johnstown to Pittsburgh	104	"
Total, Canal and Railway	394	"

“A storage reservoir for the Western division of the canal
“ was built on the South Fork of the Little Connemaugh river,
“ the sluice gates being finally closed June 10th, 1852. The
“ work cost as nearly as can be ascertained $166,647.50. The
“ dam, about eight hundred forty feet long, across the valley,
“ was an embankment of stone and earth made perfectly water
“ tight and raised ten feet above the surface of the pool, hav-
“ ing a wasteway or channel cut in the solid rock at one end
“ of the dam for the passage of flood water. The depth of
“ water above the bottom of the feeding pipes was to be about
“ seventy-two feet. The area covered four hundred sixty-five
“ acres with a content of 525,000,000 cubic feet of water. The
“ water shed supplying it and having for its eastern boundary
“ the summit of the Alleghany mountains contained 48.6 square
“ miles. In July, 1857, the canal with the western reservoir
“ was sold to the Pennsylvania Railroad company. In July,
“1862, the dam broke where the feeding pipes entered the cul-
“ verts washing out the upper end of the culvert and part of
“ the embankment of the dam. In March, 1875, about five hun-
“ dred acres of land, including the site of the reservoir, was
“ sold and in June, 1880, passed into the hands of the South
“ Fork hunting and fishing club. In April of that year the
“ work of repairing the break in the dam was begun, it being
“ completed in 1881. The top of the dam was practically level
“ and was 7.96 feet above the floor of the wasteway, or 2.04
“ feet below its height as originally designed, but of far greater
“ consequence the wasteway itself instead of being one hun-
“ dred and fifty feet wide as recommended by Mr. W. E. Morris,
“ the state's engineer, was at a point one hundred and seventy-
“ six feet from the lake but about seventy feet wide and this,

"a defect of the original construction, was the controlling "point. This spill-way not having a sufficient discharge ca- "pacity, the accumulated water rose to such a height as to "overflow the crest of the dam and caused a collapse by wash- "ing it down from the top. The dam itself or the parts of it "which were left standing, showed undoubtedly that it was "well and thoroughly built and that it would have success- "fully resisted the pressure of the water. The exposed sides "of the breaks show distinctly that the compact layers of which "the structure was formed were not obliterated by the wear- "ing action of the flood and they stood conspicuous witnesses "of the value of an earth embankment, when well built of good "materials, to impound large bodies of water. The breach in "the embankment was about four hundred and twenty feet "wide at the top and fifty to two hundred feet wide at the bot- "tom. When the dam broke the water rushed out so rapidly "that there was a depression of at least ten feet in the sur- "face of the water flowing out, on a line with the inner face "of the breach and sloping back to the level of the lake about "one hundred and fifty feet from the breach; the reservoir was "emptied in about forty-five minutes. Two and one-half miles "below the dam the South Fork unites with the Conemaugh "river. From this point to Johnstown along the Pennsyl- "vania Railroad the distance is about nine miles. The Rail- "road follows the Conemaugh river, which flows in a deep "valley, the average descent is about thirty-three feet per "mile, the maximum grade being 52.8 feet per mile; but the "river, being more circuitous, is about three miles longer, its "descent between the same points being substantially the "same, or about three hundred feet. The rise of the water "during the flood was generally about thirty feet: at some "points, however, it was considerably more, at Bridge 6, for "example, it was nearly fifty feet. The flood washed away "nearly all the bridges between South Fork station and Johns- "town, except the stone skew arch bridge near the Cambria "iron works, and nearly all the embankments and a great "part of the tracks." The round-house at Conemaugh was destroyed and the locomotives in the same washed down the stream, one, a heavy freight engine, to a distance of thirty-three hundred feet.

The dam broke at 3 p. m. of Friday, May 31st. On that day I had been making an inspection trip of our Tuscarawas branch when I received orders to proceed at once to headquarters, load all the available bridge material, fit up a camp train and provision the same, muster the division's force of carpenters and hold them in readiness for further instructions. Before midnight of Friday the detail of the Pittsburgh division of the Pan Handle was set to work and by night had made such repairs of the track from Sang Hollow to the bridge at Johnstown as made possible the operation of a single line. By this time the extent of the calamity began to be realized and the line was given up to the transport of relief committees, supplies of provisions, and coffins, succor for the living and housing for the dead. It was not until five o'clock of the morning of June 3d, when Mr. J. F. Miller arrived on the ground and assumed personal charge, that the work of further repairs began. Even then the forces had to be marshalled slowly, for there was but little room at the front for those at work, and the lines of communication were badly hampered with the work of relief. The supplies for the Red Cross society and relief committees always had precedence over everything. Much had been done, however, in providing material; large quantities of track material had been purchased and loaded at Pittsburgh, timber was being forwarded from Cincinnati and Cleveland, and the large mills of The Alex. McClure Company at Pittsburgh were running night and day in its production. Profiting by the experience of 1886 each detail of men brought with them a train provided with commissary and sleeping accommodations. When later the men from the repair shops were added, a camp was established and these men lodged in tents. On Monday I was ordered to the Bow Bridge over the Conemaugh on the West Penn division. At this point the river makes one of its characteristic sweeps, and the railroad avoids a detour of three miles by crossing the river twice and tunneling the dividing ridge. The upper of the two bridges a three span deck Howe truss, built on a three degree curve, from which latter fact it came by its name, had been washed away. Arriving at 4:30 p. m. we found room to stand one car between the portal of the tunnel and the edge of the bank, from which the bridge's abutment had been torn. The timber after being unloaded and cut to proper lengths had to be slid down and framed into bents on the slope of the bank; whence the bents were launched into the stream, steadied by guide lines, floated to position, and raised to place with balance beams, the fall lines leading back to the train, the engine of which was well back in the tunnel. Signals were passed by lanterns. With the water seven feet deep in the stream, running like a mill race and still carrying much floating wreckage, the bottom covered with stones from the fallen abutment and piers, the work with our light force was very severe. We worked without interruption except for meals, of which we served five a day, until 10:30 of Wednesday night. Beginning again at 5 a. m. of Thursday we joined our work against that erected by the force of the West Penn division at 3:30 p. m. During this time we had erected twelve bents fourteen feet on centers, the shore bents averaging twenty-four feet high and the last six bents each forty-three feet high, decked the same and laid track upon them. The working force consisted of seventeen bridge carpenters and sixteen track laborers, including all foremen. Loading up our material we moved to Johnstown via Pittsburgh, picking up en route a second work train from my division so that our force was increased to eighty-seven men. On reporting to Mr. Miller at Johnstown at 4:30 p. m. of Friday I was taken over the work by him when he explained to me in detail what he had in view and what he expected to accomplish. I was placed in charge of the night force and at 7:20 p. m. began the work of closing up a gap in the trestle at Buttermilk falls. The flood at this point had scoured the track and road-bed away from the side of the mountain, exposing the rock face. Steps had to be cut out on which to foot the posts of the bents. Every post had to be of a special length, the material to be moved out a long distance on timber trucks, and the work to be prosecuted by the light of torches. It was a hard night's work and when relieved by the day shift we had erected but thirteen bents. On the night of the 8th my force was increased by details from the Chicago division of the Fort Wayne and the Pittsburgh division of the Pan Handle and at 5 o'clock Sunday morning we ran an engine over the trestle and moved up to Bridge No. 6. This trestle consisted of one hundred and one bents, or about fifteen hundred lineal feet, averaged fifteen feet in height and was built to carry two tracks, but one of which had been laid up to this time. On Friday night I had consolidated my two trains, shifting the timber and tool cars and placing the cooks' cars back to back with the provision cars between. It was this train that we moved forward at day-break of the ninth, taking up a commanding position at the front that was subsequently of great advantage to us. On the following day an effort was made to establish a camp near by, but the topography was so forbidding that it was abandoned, and, with the exception of my men, the forces had to be removed back and forth between Conemaugh and Bridge 6. During Saturday afternoon some timber had been taken to this point on push cars and I had detailed a small gang which during the night had begun the erection of shore bents. This work was now pushed with vigor and when we retired at 11 o'clock a. m. we had eleven bents in place and two ready for erection. We had also set up and cut in a telegraph office. The general superintendent had arranged that we should work until noon of Sunday, an eighteen-hour stretch, and the day force until the morning of Monday, thus effecting a shift of his forces without any loss of time. Of the work of the 10th on the west side of the opening my memorandum of the day shows the bents to have ranged in height from forty-one feet eight inches to fifty-two feet, and to have been erected in an average time of 47 minutes to each bent or an advance of a lineal foot every three minutes. This trestle was built on a nine degree curve and far enough off the line to permit the subsequent construction of a stone arch bridge on the original alignment.

The timber was unloaded from the cars, cut to proper length, slid down the bank into the water where the bents were framed, floated to place and lifted with balance beams, girt stripped, stringered, and decked. We worked here the forces which I had brought with me to Johnstown. The excellence of their performance, which is said to compare favorably with any work of this character previously done in this country, I attribute to the large experience, capability and resourcefulness of the master carpenter in charge, Mr. Frank R. Martin, to the discipline which the force as a working body received, and the acquaintance and confidence it had acquired, during their isolated work at night and at the Bow bridge, and not least to the very advantageous arrangements for caring for them that we had been able to effect. That night an engine was run over the bridge and the track connected with that laid from the east by the forces of the Pennsylvania Railroad.

Single track communication had now been established, but at a conference held by President Roberts, General Managers Pugh and McCrea, General Superintendent Miller, and Superintendent Pitcairn, it was decided that in view of the enormous volume of business to be moved a gauntlet protected by interlocking should be erected at Bridge 6 and the balance of the line double tracked before it was opened for traffic. The forces were therefore redistributed, the work renewed with increased vigor, and at 9:50 a. m. of Friday, the 14th of June, the first passenger train since the breaking of the dam, passed through, the road being in a candition to warrant its use at a speed of thirty miles per hour. It had rained every day while we were there, some of the storms being very severe. We had some twenty-five cases of sickness or injury during our stay, but these were promptly cared for by the company's surgeons, who also inspected the daily supplies of meat and vegetables forwarded us from Pittsburgh and looked after the cleanliness and condition of the camps and commissary trains. During the eleven days the repairs were in progress, besides the work at Bow bridge, the forces from the Pennsylvania lines west of Pittsburgh had built thirty-two hundred lineal feet of trestle work from fifteen to fifty-two feet in height, laid twenty-nine thousand lineal feet of main track and nine thousand lineal feet of sidings and yard tracks, with numerous switches and connections requiring heavy grading in many places, had rebuilt the telegraph lines, connecting in the offices and stringing eighty-five miles of wire, erected a water tank and pumping station, had cleaned up a great amount of wreckage, and had retracked many of the engines and cars. This force was organized as follows:

J. F. Miller, general superintendent.

Staff Officers—Thos. Rodd, chief engineer, North West system; E. B. Wall, superintendent motive power, South West system; E. C. Bradley, superintendent telegraph; C. M. Bennett, division superintendent; W. W. Mansfield, division superintendent; H. I. Miller, division superintendent; Dr. Thos. Gallagher, surgeon.

Line Officers—One engineer of signals; seven engineers maintenance of way; ten master carpenters; ten supervisors of track, two chief line repairers.

Working Force—42 bridge foremen; 285 bridge carpenters; 100 shop carpenters; 41 track foremen; 680 track laborers; 3 line foremen; 45 linemen—a total of 39 officers and 1,196 men.

Since then our camp train has been out four times: In February, 1891, repairing washouts along the Ohio river; January, 1893, clearing snow blockade at Cleveland; November, 1893, trestling on the Cleveland and Marietta division, a temporary line having been built around a tunnel which was burning out. In May, 1894, the force was again sent to the P. R. R., the Conemaugh having washed out the road-bed near South Fork. So proficient does practice make, that two and one-half hours after receiving this last notice to go we were on our way, first having loaded five car-loads of timber and fitted up and provisioned the train. The following is a bill of the material usually taken:

List of five cars emergency material that will build about two hundred and eighty feet of frame trestle averaging twenty feet high, bents fourteen feet on centers.

28 pieces pine 12 in. x 12 in. x 42 ft. or 42 pieces pine 12 in. x 12 in. x 28 ft.	two cars.
30 pieces pine 12 in. x 12 in. x 32 ft. 15 pieces pine 12 in. x 12 in. x 24 ft.	two cars.
20 pieces pine 12 in. x 12 in. x 20 ft. 13 pieces pine 12 in. x 12 in. x 16 ft.	one car.
84 pieces pine 2 in. x 12 in. x 24 ft. 40 pieces pine 2 in. x 12 in. x 20 ft.	load on top of 12 in. x 12 in. timber.
100 drift bolts ¾ in. x 20 in., button head 100 drift bolts ¾ in. x 12 in., button head	throw loose in one of the cars.

List of tools carried in bridge carpenter's tool car:

2 axes,
4 steel bars (small),
2 pairs double blocks,
2 fall lines (1 in., 250 feet long),
100 ft. 1 in. rope (tag lines, etc.),
300 ft. 1½ in. rope,
1 pair double and treble blocks No. 10,
4 slings of 1½ in. rope,
4 chains 4 feet long,
4 cant hooks,
4 pike poles (20 feet long),
1 track level,
2 kegs 6 in. boat spikes,
1 keg 8 in. boat spikes,
2 foot adzes,
1 grind stone,
4 augurs (⅞ in.),
2 cross-cut saws,
6 timber trucks,
2 rail buggies,
4 carrying hooks,
1 square,
1 50 ft. tape line,
1 16-ft. pole graduated to feet and halves,
1 plumb bob,
2 monkey wrenches,
4 spike mauls.

The emergency tool box is 5 x 2 x 2 1-2 feet and contains:

1 cross cut saw (especially sharpened and set for sawing pine),
1 square,
1 level,
1 foot adze,
1 monkey wrench,
1 augur, ⅞ in.
2 shovels,
2 spike mauls,
1 track jack,
1 hand axe,
2 steel bars (1⅛ in. x 5 ft.),
2 red flags.

I append also a list of supplies furnished. On the whole our bill of fare is as it ought to be, rather more generous than the United States army ration. We find it advisable to use canned goods largely because they keep well, are easily handled, and those unused can be returned. The apparent deficiency in meats, vegetables and bread stuffs is because we depend upon having these supplied regularly after the first four days from some near-by town.

Bill of supplies for camp train.

	Order No. 1, 30 men for 4 days.	Order No. 2, 50 men for 4 days.	Order No. 3, 75 men for 4 days.	Order No. 4, 60 men for 10 days.
Coffee	35 lbs.	60 lbs.	90 lbs.	180 lbs.
Tea	1 lb.	2 lbs.	3 lbs.	6 lbs.
Flour	50 lbs.	50 lbs.	100 lbs.	150 lbs.
Bread	35 loaves	60 loaves	90 loaves	90 loaves
Crackers	20 lbs.	30 lbs.	45 lbs.	90 lbs.
Gran. sugar	30 lbs.	50 lbs.	75 lbs.	150 lbs.
L. B. sugar	6 lbs.	10 lbs.	15 lbs.	30 lbs.
Condensed milk	6 cans	9 cans	12 cans	27 cans
Lard	15 lbs.	25 lbs.	35 lbs	75 lbs.
Butter	20 lbs.	35 lbs.	45 lbs.	80 lbs.
Eggs	20 doz.	30 doz.	45 doz.	50 doz.
Potatoes	2 bush.	3 bush.	5 bush.	9 bush.
Onions	½ bush.	1 bush.	1½ bush.	3 bush.
Cabbage	30 lbs.	50 lbs.	75 lbs.	75 lbs.
Cheese	20 lbs.	30 lbs.	45 lbs.	90 lbs.
Apple butter	5 lbs.	10 lbs.	15 lbs.	30 lbs.
Jelly	5 lbs.	10 lbs.	15 lbs.	30 lbs.
Rice	5 lbs.	10 lbs.	15 lbs.	30 lbs.
Beans	¼ bush.	½ bush.	¾ bush.	1½ bush.
Tomatoes	½ doz.	1 doz.	1½ doz.	3 doz.
Corn	1½ doz.	2 doz.	3 doz.	6 doz.
Peas	½ doz.	1 doz.	1½ doz.	3 doz.
Peaches	1½ doz.	2 doz.	3 doz.	6 doz.
Raisins	3 lbs.	5 lbs.	7 lbs.	15 lbs.
Nutmegs	¼ doz.	½ doz.	¾ doz.	1½ doz.

Bill of supplies for camp train—Continued.

	Order No. 1, 30 men for 4 days.	Order No. 2, 50 men for 4 days.	Order No. 3, 75 men for 4 days.	Order No. 4, 60 men for 10 days.
Sage	1 box	1 box	2 bxs.	2 bxs.
Vanilla	1 bot.	1 bot.	1 bot.	2 bots.
Lemon	1 bot.	1 bot.	1 bot.	2 bots.
Sweet Marjoram	1 box	1 box	1 box	1 box
Cinnamon	1 paper	1 paper	2 pap'rs	2 pap'rs
Ginger	¼ lb.	¼ lb.	¼ lb.	½ lb.
Pepper	1 lb.	2 lbs.	2 lbs.	3 lbs.
Salt	4 lbs.	8 lbs.	12 lbs.	24 lbs.
Mustard	2 bot.	3 bot.	4 bot.	8 bot.
Catsup	½ doz.	1 doz.	1½ doz.	3 doz.
Pickles	10 doz.	15 doz.	25 doz.	45 doz.
Vinegar and jug	1 gal.	1 gal.	1 gal.	2 gal.
Soap	15 cakes	25 cakes	35 cakes	75 cakes
Sapolio	3 cakes	3 cakes	3 cakes	3 cakes
	30 lbs.	40 lbs.	60 lbs.	120 lbs.
Baking powder	1 lb.	1 lb.	1 lb.	2 lbs.
Ham	60 lbs.	100 lbs.	150 lbs.	300 lbs.
Breakfast bacon	10 lbs.	15 lbs.	25 lbs.	45 lbs.
Canned corn beef	1½ doz.	2 doz.	3 doz.	6 doz.
Canned salmon	¼ doz.	½ doz.	¾ doz.	1½ doz.
Steak and roast—				
Summer	75 lbs.	125 lbs.	150 lbs.	150 lbs.
Winter	120 lbs.	200 lbs.	250 lbs.	250 lbs.
Boiling meat	30 lbs.	50 lbs.	50 lbs.	50 lbs.

STRIKES.

Although I was in the service of the Pennsylvania Railroad during the great strike of 1877 I saw but little of it, the New York end of the line not being involved. The militia were stationed in the large yards on the Meadows, at the bridges over the Hackensack and Raritan, and at other exposed points, but the traffic continued to be moved and there was no disorder nor any considerable defection of the men. From that time until the Haymarket riots at Chicago in 1886 there were no disturbances. Since then scarce a year has passed without some fighting. It is with much satisfaction that I say that during all this time we have had no misunderstandings with our employes of the better grades. Either the attacks have been made on us by rank outsiders, or we have become involved in conflicts originating on other lines, through the attempted institution of the boycott; or when our own employes have taken the initiative it has almost invariably been the yardmen, and then as members of a coalition affecting all the railroads at some great terminal. At no time have more than a fraction of one per cent. of the total number of employes been engaged. The large wages paid by the Company and its just and liberal treatment of its employes are well evidenced by the history of their relations during this period.

The Century dictionary defines a strike to be, "To press a "claim or demand by coercive or threatening action of some "kind; in common usage, to quit work along with others in "order to compel an employer to accede to some demand, as "for increase of pay, or to protest against something, as a re-"duction of wages."

This definition is exact only up to the time when the employer resumes the conduct of his business. Then must be looked for actions that find a parallel only in the atrocities of the "Unspeakable Turk"; threats, assaults, murders, arson, and every form of destruction of property; the rights of the individual denied, the operation of the laws resisted, anarchy with all its hideous consequences.

The morning after the Haymarket riots we opened up the Halstead street freight houses of the Pan Handle with a force of sixty-five volunteers, the freight handlers and checkmen having all gone out with the eight-hour agitators on the 1st of May, 1886. This force was, for safety, housed and fed in the freight houses. In 1888 the yardmen of the Fort Wayne went out in sympathy with the enginemen and firemen who had quit the service of the C. B. & Q. R. R., and I was detailed to fit up the 16th and 55th street round houses for the accommodation of four hundred men. After being out two days the yardmen returned to work and the accommodations, though provided, were not used. In May, 1890, anticipating a strike of the yardmen on all the lines entering Pittsburgh, I assisted the late Mr. E. B. Wall in the preparation of a plan for provisioning and protecting the men who would work. In June, 1890, the yardmen on all the lines at Cleveland, Ohio, struck for the Chicago scale of wages. After being out five days about forty per cent. of our men returned, accepting the rates offered before the strike. In April, 1894, the United Coal Miners of America declared a strike. Coal then began coming into Ohio from the mines of West Virginia. The strikers, in order to stop the rail movement of coal, made an attack upon the railroads. Tracks were greased or blockaded with rocks, and material piled upon them, rails were torn up, bridges burned, and crews driven from trains, interrupting for days the entire business of certain railroads, both freight and passenger. In this trouble my division was to some extent involved. To restore peace the entire national guard of the state, except two regiments, was on duty from June 6th to June 21st.

On May 11th, 1894, the employes of the Pullman palace car works went out on a strike against a reduction of wages. In June the American Railway Union held their annual meeting in the city of Chicago. Flushed with their victory over the Great Northern Railway company, casting about for new fields to conquer, and being encouraged by the local conditions surrounding the Pullman controversy, they decided upon making the issue of the striking employes of that company their own, and on June 22d sent out an order calling for a boycott against the Pullman cars on all the railroads entering Chicago, the order to take effect at noon, June 26th.

The railroads, having large property interests involved, having contracts with the Pullman company that could be enforced at law, and owing certain duties to the public as common carriers, met on June 25th, in response to a call of the General Managers' Association, to consider the measures for defense.

On June 28th, while engaged in an inspection trip over my own rails, I received telegraphic instructions to report for duty at Chicago, and reached there at 7 o'clock a. m. of June 29th. At the outskirts of the city I met one of the local police officers of the road, and learned from him that the Pan Handle crossing watchmen, switch tenders, interlocking towermen, and the crews of the switching engines engaged in making up departing trains, had either joined in the strike or been driven from their work. Their places had been filled by a volunteer corps of some seventy men brought from various points on the line, many of them minor officers of the Company, yard masters, train masters, road foremen of engines, and others, and such work as it was then thought advisable to attempt was being promptly handled. On the Fort Wayne, all of the men in the interlocking towers, the switch tenders, and the night switching crews had quit work, but a sufficient force had been brought in from outlying points to keep trains moving on time. At the depot I was met by my general superintendent, and on the way to the hotel and breakfast was told that the General Managers' association had opened up recruiting agencies at the various eastern cities and that a number of men were already on their way to Chicago, while numerous applications for employment were being received. Up to this time trains were moving in and out of the city with but little, if any, delay.

As early as the night of the 27th the strikers had burned seven empty cars standing near Mud Lake bridge on the Pan Handle. Now, everywhere, small crowds were congregating and threatening the men still at work, and it was evident, from the fact that the police made no effort whatever to disperse them, but in some cases advised the volunteers to get out of town, that we could not look for help from that department in the maintenance of peace. The saloons were centers for the congregation of strikers and the tough element generally, and later became rendezvous where they met and discussed their plans and from which they started on their tours of violence and depredation. The feeling of the people along the line was intensely hostile and it was impossible to secure board and lodgings for any of the employes. It was clear that we would be compelled to organize a protective force of some size, to fit up barracks for the care and sustenance of the men at work where they could be afforded protection, and that lines of communication would have to be established, reaching to points along the tracks so that information might be constantly and promptly received and the operations directed.

The headquarters of the company had already been established in the Grand Pacific hotel near the main offices of the Western Union Telegraph company, a 19-wire cable strung in, and three operators installed, giving us through telegraphic communication with the general offices of the company, the principal outlying cities, and local communication with the lines in the affected districts. Long distance and local telephone wires were also brought into the room and were in constant use. The general superintendents, Mr. J. F. Miller of the Pan Handle and Mr. Charles Watts of the Fort Wayne, having decided to consolidate the arrangements for protection and commissary for both lines, I was placed in charge of the same, and, subsequently, on Mr. Miller's going to Indianapolis, because of the disorders there, he intrusted to me the general conduct of his operations, giving me instructions from time to time by wire. It was decided to open up Barrack No. 1 at the 55th Street round-house on the Fort Wayne, and after deciding upon the details of the construction of bunks, tables, etc., a force of shopmen began their erection. A detail of cooks and waiters was secured through the office of the Pullman company, that company also furnishing cooking utensils and table ware, and introducing us to the supply house from which they secured their provisions. All through the trouble, provisions of every description were very promptly furnished us and at very reasonable prices—for several days the price of meat was considerably advanced, and on one day the price of potatoes reached $5.25 per barrel, but as a rule the prices of staple articles were not much disturbed. I telegraphed for two young men from my own division, both of whom had had considerable experience in handling commissary during washouts and snow blockades, and upon their arrival that service was organized, with Mr. Atterbury in general charge, Mr. Haas in charge on the Fort Wayne, and Mr. Sanfod in charge on the Pan Handle. Barrack No. 3 had already been established at the Curtis street round house, the first meals being served on the morning of June 29th, several cars belonging to the telegraph department having been massed there, the cooks and waiters being furnished from among the employes of the company.

On the night of June 29th a mob of about 800 people flagged a southbound passenger train at Riverdale on the Pan Handle, drove the passengers, including women and children, out of the sleeping cars into the coaches, and after pushing the sleepers in on the siding ordered the crew to proceed with their train. The train was stopped at the second station beyond and held until about 2 o'clock in the morning, when, the mob having dispersed, it returned, picked up its sleepers and proceeded to destination. Up to this time a detail of city police had been accompanying the trains as far as the city line where they disembarked. The point selected by the mob was just outside the city limits, and beyond the jurisdiction of the police. As soon as the news of the holding up of the train was received, the sheriff of Cook county was notified and that officer, accompanied by one of his deputies, arrived at the hotel about midnight, where a consultation was held, Mr. Egan of the General Managers' Association being present. At the conference the sheriff said that it would be of little use for him to attempt to do anything before morning as his men were all out of the city, but it was finally agreed that he should try to collect a force at once. It was now apparent that protection was necessary on all moving trains, at least as far as the Illinois state line, and that each train would have to be accompanied by guards with authority enabling them to act both within and without the city. The sheriff in order to avoid conflict of authority had decided to confine his exertions to such portions of the county as lay outside the city limits. A detail of thirty United States deputy marshals was therefore secured from United States Marshal Arnold's office to ride these trains in and out, and, as the marshal had no means of taking care of them, barrack train No. 5 was fitted up for their maintenance. This train was first set off at Bernice and was there attacked and sacked by a mob of brick makers from the manufactories at that place, who broke all the windows in the train, poured oil on the steps of the cars and set fire to them. Fortunately, however, we were able to get the deputy marshals on the ground in time to drive back the mob and put out the fire. The train was then moved to the state line, a deserted prairie district, where it remained without further disturbance, a force of guards being left in charge at all times. The first meals were served at this barracks on July 2d. A telegraph office was set up at this point, so that we were in communication day and night.

The sheriff began massing deputies as promised, but he having no means for caring for them, it was finally agreed that the Illinois Central railway, which crosses us at Riverdale and which had for a while been supporting them, should furnish the sleeping accommodations, and that we should provide the rations. Barrack train No. 4 was therefore fitted up and established at that point, the first meals being served on July 5th.

In addition to the guards placed upon passenger trains, it became necessary to organize further protection, as, notwithstanding the fact that many of the employes had been assaulted and beaten, and that crowds gathered on the viaducts and threw stones and other missiles at the men at work, no arrests were being made by the police, and it was evident that we must undertake to protect the men from assault, the barracks from being sacked, and to secure evidence for the arrest of parties by warrant. The territory was districted and a force of about two hundred men sworn in as deputy marshals to act as guards for the men and property, while about thirty men were detailed to mix with the mob, and, working as detectives, secure evidence for the arrest and conviction of rioters. The sergeants in charge of the squads in the several districts reported to a lieutenant, there being one for the Fort Wayne and one for the Pan Handle line; they in turn were under the command of a captain who directed the movement of the entire force. I was fortunate in securing for this service Capt. E. A. Abbott, a veteran of the late war, a man who had had a large and extensive experience in the United States secret service, and who enjoyed the confidence of all who were familiar with his work.

On July 1st all the shopmen were laid off, and as our gatemen were being driven from their posts the crossing gates were generally taken down and trains moved over crossings by hand signal. During that day mobs were constantly forming along the line, and stone throwing was freely indulged in.

On July 2nd an injunction was issued by Judges Wood and Grosscup of the United States court, and on the 3d some two thousand copies of the document were printed and posted in conspicuous places on the railroad property, and some fifty or more notices were served on men lately in our employ who were known to be active in stirring up disorders. This action, however, had no appreciable effect.

On July 3d in some districts the riotous element seemed to have gotten complete control. A mob of about two thousand people stopped one of the Fort Wayne passenger trains, and, having driven the crew from the train, ran some box cars out onto the main track and upset them, completely blocking it. The mob then proceeded up the track six blocks where they overturned more cars. A number of our deputies were sent to the rescue and after securing the assistance of a squad of police officers from a nearby police station, the wreck train, working under their protection, cleared the tracks in a short time.

Anticipating that the trouble would culminate on the 4th of July, the work for the three preceding days had been directed with a view to handling the passenger traffic, to take out of Chicago all the freight received and in transit, and to unloading all the freight on the line so that when business closed on the night of the 3d there would be, in case of fire, nothing but empty cars to burn.

On the 4th of July no effort was made to handle any freight, work being limited to the handling of passenger traffic and to the perfecting of details for the future conduct of business. Our experience of the 3d made it evident that we must be in a position to use a considerable force of deputy marshals upon short notice, and I therefore went carefully through the entire force and, picking twenty men, all of whom had been under fire, quartered them at a hotel near the depot, arming them with Spencer repeating shot guns, generally known as the "riot gun," and supplied them with two thousand rounds of ammunition. Arrangements were made with a livery firm and two wagons were fitted up to be used as patrol wagons. This force was several times used to advantage, and, after the culmination of the disorder on the 7th, was distributed so as to guard the more exposed points on the line.

On the 5th of July mobs patrolled the Fort Wayne tracks all day long. Passenger trains moved until about noon when a train was stopped by obstructions heaped on the tracks at 41st street by the mob, the leaders of which climbed up in the cab, beat the engineer and fireman and forced them and the passengers into flight. After this hour traffic was interrupted until the morning of the 6th. During the afternoon of the 5th freight cars were overturned on the tracks and the mob, estimated to number twenty thousand people, swarmed around the handful of regular troops stationed on the railroad property. During the night a zigzag line was opened up through the yard so that by 5 o'clock a. m. passenger traffic was again resumed, nor was it on this route interrupted for any considerable time thereafter.

During the day a mob at Hammond, Indiana, had gotten entirely beyond the control of the sheriff, so that it became necessary temporarily to abandon our short line through that town. Subsequently both the Indiana and Illinois militia as well as the regular troops were employed in restoring order.

There were some incendiary fires during the night, but these were promptly put out by the fire department. What was coming was clearly foreshadowed by the burning of several of the buildings of the Columbian exposition. On this date the mayor issued a proclamation warning the people to avoid places where crowds congregated, asserting his intention to enforce the law and directing the police to disperse assemblages of persons on or near railroad tracks. He also called the attention of the chief of police to the fact that mobs were overturning freight cars in the presence of police officers, calling upon him to see that proper discipline was maintained in the force. The chief, in an interview, announced that "every railroad "operating a line into Chicago could run its trains tomorrow, "the tracks would be kept clear and the strikers kept back, "and the railroads given an opportunity."

During the day of the 6th of July all cars were switched off the tracks connecting with the main track, so that they could not be run out and overturned, and the switches were spiked and the rails taken up at all connections to private sidings so that cars could not be run out from these to block the main line.

Traffic on the Pan Handle had meantime proceeded without much interruption, until early on the evening of the 6th a mob of about two thousand began starting fires in the yard at 55th street. As they were beyond control of the police and cut the hose of the fire department, all the cars in the yard, some seven hundred and ten, of which seventy-four were loaded with coal and general merchandise, were totally destroyed. The fire so badly twisted the rails and burned the cross ties that traffic was impossible, and no trains were handled, after 3 o'clock of the afternoon of the 6th, until the evening of the 7th.

In order that proper testimony might be had in presenting a claim for losses against Cook county, arrangements were at once made to have the property examined, measured, and inventoried by competent, impartial experts, and to have photographs taken of the wreckage by an expert photographer.

The wreck train was started out promptly at 4 a. m. of the

7th, to open up communication, pushing ahead of its engine a gondola carrying the special force of twenty deputies armed with riot guns. After reaching 39th street we were further protected by a company of the 15th Regular Infantry commanded by Captain Chapin. The day passed without special incident but upon the return of the wreck train in the evening escorting a delayed mail train, the trains were stopped at 22nd street by a line of hose stretched across the track by the fire department who were trying to extinguish a fire that the mob had started in some cars. The trains were set upon by the mob who began throwing stones. The marshals attempted to make some arrests. The soldiers were disembarked, some shots were fired and one of the rioters killed; the troops then charged the mob, who, under the savage bayoneting and the use of the butts, broke and fled in all directions.

On this date it seems to have been made clear to the mayor that there were riots going on in Chicago and that the boast of his chief of police was idle talk. He thereupon informed the governor that "the police and other peace officers at the disposal of the authorities were unable to restore peace and to "prevent violence to persons and property, and called upon "him to order sufficient military forces of the state to aid the "civil authorities of the city in suppressing such violence and "enforce the law, and suggested that five regiments of state "militia be sent immediately." Upon this request the first and third brigades were directed to act under instructions of the mayor, and were distributed at various points along the lines of the roads entering the city. They came totally unprovided with food, and such of them as were stationed along our lines were fed at the barracks already established. On this date also we purchased one hundred additional riot guns for distribution among the deputy marshals, with one hundred rounds of ammunition per gun. There was fortunately no necessity for their use. The insurrection was broken on the 7th, when the 2nd Illinois National Guard (Company F) fired on the mob at 49th and Loomis streets.

It having been decided by General Miles to place on duty at the various union depots forces of troops to operate on the lines using them, two companies were stationed at our depot accompanying a force of seventy-eight deputy marshals. There being no territory which could be assigned for the use of the troops, and the marshals being without means of subsistence, barrack trains Nos. 2a and 2b were fitted up for the accommodation of these forces and established at the Union depot, the first meals being served on July 7th. The troops remained on duty until July 20th when they were withdrawn, the marshal's force having been earlier disbanded. By the 9th business was fully resumed.

The general commissary and police arrangements were continued until the 20th, after which the forces were gradually reduced and the barracks discontinued, the last to close being barrack No. 1, which was abandoned July 31st, the new men by that time having secured boarding houses in the neighborhood.

THE DRAMATIS PERSONÆ.

26 Railroads, only 15 of which operated Pullman cars.

211,504 Employes, 18,464, or 8.7 per cent. of whom became involved in the strike.

8,692 Employes on strike in Chicago, classified by occupation as follows:

Yard engineers	485
Yard firemen	575
Road engineers	47
Road firemen	74
Yard conductors and brakemen	1,798
Road conductors and brakemen	534
Switch tenders	158
Yard masters and assistants	33
Yard clerks	112
Telegraph operators	31
Shopmen	1,662
Round house employes	34
Car inspectors	49
Freight house employes	288
Passenger station employes	37
Section foremen	7
Section laborers	550
Bridge carpenters	45
Crossing watchmen	281
Interlocking men and bridge tenders	206
Unclassified	1,685
Total	8,692

U. S. Army	1,910
Illinois militia	3,490
Chicago local military organizations	315
Chicago city police	3,500
Cook county deputy sheriffs	350
U. S. deputy marshals	1,600
Total	10,166
Railroad employes sworn in as U. S. deputy marshals in addition to above	2,800
Magistrates, judges, newspaper correspondents, mob, etc.	

The following tables have been prepared with a view of showing the losses and expenses sustained by the company during the riots:

Table No. 1—The estimated loss of revenue during ten days of the partial suspension of business is based upon a comparison of the business handled during that period and a corresponding period of ten days immediately preceding it. Much of the decrease in freight earnings was not a loss, but shipments were held back and earnings subsequently made on them when they were moved; indeed taking the Pennsylvania lines in their entirety it is doubtful if there was any loss on this account.

Class of traffic.	Ft. Wayne.	Pan Handle.	Total.
Passengers	$9,820 19	$312 31	$10,132 50
Freight	98,243 17	74,739 79	172,982 96
Total	$108.063 36	$75,052 10	$183,115 46

Table No. 2—An approximate estimate of the value of property destroyed is compiled from reports of our own employes and from those of experts employed for that purpose. The total amount is probably an underestimate.

Schedule.	Class.	Ft. Wayne	Pan Handle.	Total.
A	Buildings	$523 85	$1,342 54	$1,866 39
B	Tracks	....	16,917 65	16,917 65
C	Rolling stock	6,040 70	147,049 52	153,090 22
D	Passenger equipment and engines	121 85	624 00	745 85
E	Damage to, and stolen freight	....	13,757 24	13,757 24
F	Clearing tracks of wreckage and debris	365 86	4,179 42	4,545 28
	Total	$7,052 26	$183,870 37	$190,922 63

Table No. 3—Showing the expense on account of the commissary department, including the cost of fitting up, kitchen furniture, broken crockery, wages of cooks, provisions, etc.

Number of meals served and cost of same.

	U. S. troops.	U. S. marshals.	State troops.	Deputy sheriffs.	Police.	Employes.	Average cost per meal.	Total.	
								Meals.	Cost.
Barrack No. 1	110	2927	4331	...	410	9313	.161	17,091	$2,751 66
Barrack No. 2, Trains A. & B.	2276	2133	..	..	21	1353	.231	5,783	1,355 86
Barrack No. 3	.....	2957	....	...	1016	16915	.230	20,888	4,801 02
Barrack No. 4	. ....	1312	12	6978	....	674	.139	8,976	1,245 15
Barrack No. 5	......	1012	....	....	.. .	326	.36	1,338	481 19
At various places	......	478	....	...	....	.....	.25	478	119 50
Bills of two restaurants	. ....	415	....	452	1283	.. ..	.50	2,150	1,075 00
Bills of two hotels	... ..	......	....	....	...	......	......	......	6,273 95
Bill of Union Sta. restaurant	191	406	....	...	189	1285	.486	2,071	1,009 50
Total	2577	11640	4343	7430	2919	29866	......	58,775	$19,121 83

The total expense on account of the protective organization was $21,842.14.

A recapitulation of which items show:

Loss of business	$183,115 46
Loss and damage to property	447,930 67
Cost of commissary department	19,121 83
Cost of protective department	21,843 14
Total	$672,010 10

The work of the fire department was worthy of the highest praise. Under the most discouraging circumstances, often at great personal risk, they were active and tireless and cheerful in the performance of their duties.

The police, during the entire continuance of the riots, made no active, energetic effort to repress the same. On July 6th General Miles is quoted by the Chicago papers as saying, "There is no doubt that the police can control the mobs if they "will. There has not been a mob that could not have been "dispersed by the police by determined effort." From every one who came in contact with them, from Gen. Miles down, there is the same testimony. Numerous cases of flagrant misconduct on the part of the police were reported to the police trial board, but the proceedings before that board were of a farcical character, and I believe that in but one case (and in that one the policeman insisted upon talking and convicting himself) was punishment inflicted. Lest I appear prejudiced let me quote from the official report of Mr. J. F. Miller, general superintendent.

"M. C. B.—Ex-Pan Handle switchman, assaulted and intimidated our "flagmen and other employes in vicinity of Leavitt street yards June "29th and 30th. Police warrant was sworn out by our men at Desplaines "street station. Police officers arrested B's brother, ostensibly in error "and released him. No further effort was made to find B, although re-"peated requests were made by Mr. Loree of the inspector to serve the "warrant. Finally Mr. Bennett on July 27th submitted the matter to "Mr. St John with request that the superintendent of police be advised "of the circumstances and asked to order prompt action. This was "done but no action was taken; and still another request was made, "whereupon the inspector notified us that B could not be found, that "if we could hunt him up for them the arrest would be made. Notwith-"standing the peculiar nature of this statement we immediately put "detectives to work and soon had him located. The inspector was "notified and two officers were detailed to make the arrest. Upon hav-"ing B pointed out to them they refused to serve the warrant, handing "it to our man with the remark that we seemed to be in the business "and could do it ourselves. The detective not being deputized could "do nothing of course. He afterwards saw the policemen mixing with "the crowd and shaking hands with B and his friends. The warrant "was returned to the inspector with a statement of the facts, and a "new one sworn out before a justice and one of our detectives deputized "to serve it! Evidently B received word of this new move and fled, as "we have never been able to locate him. We would have demanded a "trial of these police officers before the trial board, but our experience "in other cases demonstrated the futility of such action and the matter "was dropped."

The sheriff seemed prompt and willing in his efforts to do his duty in maintaining order in the country districts. He had, however, no means of taking care of his deputies and the entire work of feeding and sleeping them fell upon the railroads.

The militia varied greatly in its character, some companies seeming to be well drilled and finely handled while others were very incompetent. For the most part they brought their tents with them and provided their own sleeping accommodations, but no provision was made for their sustenance and that burden also fell to the lot of the railroads.

It is, of course, under the theory of our government, primarily the duty of the state to preserve the public peace. Unfortunately there seemed but little disposition on the part of those in authority in Illinois to do their plain duty. When finally they did make the attempt they made clear their utter incapacity. They sent up a loud cry for help, and they called for help upon the very people who were most suffering from their neglect. The railroads not only had to secure new men to take the places of those who had left or been driven away from their work, to provide for their bodily sustenance and comfort, and to employ a force to protect them, but they were compelled to maintain all the municipal and state forces engaged in restoring order.

A more complete breaking down of government has never been seen in this country than the collapse of the city, county, and state authorities during the riots in the city of Chicago in July, 1894.

When the turmoil was at the highest, the lower courts discharged on their own recognizance rioters caught red handed; or fined in such insignificant amounts as $10.00, with twenty days' free time in which to pay the fine, persons arrested while committing assaults with intent to kill; and when the evidence did compel the holding of the criminals to bail to the criminal court, the justices have very generally failed up to this time to send the papers over to that court. This flattering unction cannot but afford the greatest comfort to the criminal, while the impotent efforts in the higher courts to punish the more prominent offenders has dismayed those who have had faith in the ægis of the law. With the abandonment by the administrative of certain of its functions, the judicial branch of the several governments has assumed to preserve the public peace through the exercise of its equity jurisdiction and by punishment for contempt. It will be interesting to watch the development consequent upon this change in our institutions.

The United States marshal made every effort to secure a good force of deputies and to use them effectively; but his office was broken down with the work put upon it, and he had to depend upon the railroads for the entire care of his men.

Of all the forces used in quelling the mob, the only ones brought upon the ground prepared to take care of themselves were the regular troops of the United States. The work of the regular army has been severely criticised, and it is pointed out that while their forces were on the ground at midnight of July 3d and that during their stay traffic was interrupted, railroad employes assaulted, injured and killed, and several millions of dollars worth of property destroyed, yet there was no fighting done. The army is not a *gendarmerie*; the army is a highly disciplined body, equipped with the most improved machinery, and organized upon the most effective basis, for the purpose of killing people in a decisive and expeditious manner. To bring this force into contact with a mob, by which it is assaulted with billingsgate, mud, and stones, and to give it positive orders not to perform its functions, as I think we must conclude was done in this case, is a policy which it would seem hard to justify.

It is with a great sense of relief that we turn from the contemplation of this opera bouffe exhibition of government to regard one institution that comes with credit out of the disgraceful chaos. Virile, resolute, full of resource, the railroads appear to have appreciated to the full the duties they owed to the public, and to have moved with steady determination to fulfill them. Involved in a quarrel in which they had no more interest than had any other bystander, set on by rioters led by a small but reckless squad of mutineers from their own forces, the constituted authorities affording no bulwark of defense but rather an additional burden to be spurred to action and meantime to be nourished and sustained, their conduct may well be carefully examined as affording evidence that the salt of the earth hath not lost its savor. The country owes to the railroads more than it thinks, for the preservation of peace in 1894. It is likely to be under still greater obligations in the future. Whether we regard the action of their management, dignified in the maintenance of their rights, disdainful of compromise with the wrong-doer, steadfastly holding their course through this troubled sea; or the conduct of their men, moving in small and isolated groups, quietly and indomitably to the performance of their duties, amid the howlings of the mob; there stands revealed an institution and a spirit that may well give heart to them that love the Republic, and that must be reckoned with by them that seek the destruction of the established order.

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